CLAIMS

1. A device for the trenchless replacement of in-situ pipe, comprising:

a mole;

a length of cable, said cable being engagable to said mole;

a cable pulling means including a cable pulling device and a cable pulling device engagement means functioning to provide a mounting structure for said cable pulling device.

2. A device as described in claim 1 wherein said cable pulling device includes a cable engagement mechanism that functions to pull said cable in a plurality of repeated cyclic pulling strokes.

3. A device as described in claim 1 wherein said cable engagement mechanism functions to engage said cable in a pulling stroke, release said cable in a recovery stroke, and engage said cable in a further pulling stroke, whereby said cable pulling device conducts a repeatable cycle of pulling and releasing of said cable.

4. A device as described in claim 3 wherein said cable pulling device includes at least one cable engaging collet that functions to engage said cable on a said pulling stroke and to release said cable on a said recovery stroke.

5. A device as described in claim 4 wherein at least one further collet is provided that functions to engage said cable on said recovery stroke and release said cable on said pulling stroke.

6. A device as described in claim 5 wherein said further collet is engaged within said cable pulling device.

7. A device as described in claim 2 wherein said cable pulling device is formed with a slotted cable insertion means for the sideways insertion of said cable within said cable pulling device.

8. A device as described in claim 1 wherein said cable pulling device is a post tensioning ram (PTR).

10. A device as described in claim 8 wherein said pipe is composed of a malleable material or a fracturable material.

11. A device as described in claim 8 wherein said cable pulling device is used to generate a pulling force up to and over 100 tons (200,000 pounds), for distances of from 2 feet to over one mile; said pulling forces not being affected by cable length.

12. A device as described in claim 8 wherein the PTR is relatively light weight and portable as a result of using high pressure hydraulics in small hydraulic cylinders.

13. A device as described in claim 8 where the weight to pulling force ratio of the PTR is in the range of 2 pounds of weight per ton (2,000 pounds) of pulling force.

14. A device as in claim 12 wherein high pressure hydraulics (5,500 to 20,000 PSIG) are used to give the PTR the intense pulling power it delivers.

15. A device as described in claim 1 wherein said cable pulling device engagement means includes an annulus member including a cable passage bore formed therethrough and a cable insertion slot formed through portions of said annulus member for the sideways insertion of said cable within said cable passage bore of said annulus member.

16. 15 A device as described in claim 15 wherein said annulus member includes a cable pulling device holding means for releasably holding a portion of said cable pulling device therewithin.

17. 16 A device as described in claim 1 wherein said cable pulling device engagement means includes a reaction plate having an enlarged surface for disbursing a reaction force against a cable pulling force generated by said cable pulling device.

18. 17 A device as described in claim 17 wherein said cable pulling device engagement means includes an annulus member that is releasably engagable with said cable pulling device, and wherein said annulus member is mountable in relation to said reaction plate such that said reaction plate disburses cable pulling forces exerted on said annulus by said cable pulling device.

19. 18 A device as described in claim 18 wherein said annulus is formed with a cable mounting slot, such that a side portion of said cable can be mounted into said annulus member.

20. 19 A device as described in claim 1 wherein said cable pulling device engagement means includes a cable pulling frame, said cable pulling frame being mountable to said reaction plate.

21. 20 A device as described in claim 20 wherein said cable pulling frame includes a plurality of frame members and a rotatable cable pulley being mounted to said frame members.

22. 21 A device as described in claim 21 wherein said frame members are disposed to provide a cable mounting gap that allows said frame to be mounted to a side of said cable.

23. 22 A device as described in claim 21 wherein said frame members are disposed to provide a cable engagement path in relation to said frame, such that a side portion of said cable can be mounted within said cable pulling frame and around said pulley.

24. A device as described in claim 22 herein said frame includes a plurality of leg members that are engaged at an inner end thereof to a base member, and said leg members are engaged at an outer end thereof to further frame members that engage said pulley.

25. A device as described in claim 21 wherein said frame members are shaped as plates.

26. A device as described in claim 1 wherein said mole includes a nose portion being engagable to said cable, a tapered body portion and a replacement pipe engagement portion, said mole further including at least one blade, said tapered body portion acting to expand said pipe for the replacement thereof with a length of replacement pipe, and said blade acting to cut pipe engagement devices encountered by said mole after said pipe has been expanded by said tapered body portion.

27. A device for the trenchless replacement of in-situ pipe, comprising:

a mole;

a length of cable, said cable being engagable to said mole;

a cable pulling means including a cable pulling device including a cable engagement mechanism and a cable pulling device engagement means functioning to provide a mounting structure for said cable pulling device;

said cable pulling device engagement means further including a reaction plate having an enlarged surface for disbursing a reaction force against a cable pulling force generated by said cable pulling device, and a cable pulling frame, said cable pulling frame being mountable to said reaction plate and said cable pulling device being mountable to said cable pulling frame.

28. A device as described in claim 27 wherein said cable engagement mechanism functions to engage said cable in a pulling stroke, release said cable in a recovery stroke, and engage said

cable in a further pulling stroke, whereby said cable pulling device conducts a repeatable pulling and releasing cycle of said cable; said cable pulling device including at least one cable engaging collet that functions to engage said cable on a said pulling stroke and to release said cable on a said recovery stroke, and wherein said cable pulling device is formed with a slotted cable insertion structure for the sideways insertion of said cable within said cable pulling device.

29. A device as described in claim 28 wherein said cable pulling frame includes a plurality of frame members and a rotatable cable pulley being mounted to said frame members; and wherein said frame members are disposed to provide a cable engagement path in relation to said frame, such that said cable can be sideways mounted within said cable pulling frame and around said pulley and into said cable pulling device.

30. A device as described in claim 29 wherein said mole includes a nose portion being engagable to said cable, a tapered body portion and a replacement pipe engagement portion, said mole further including at least one blade, said tapered body portion acting to expand said pipe for the replacement thereof with a length of replacement pipe, and said blade acting to cut pipe engagement devices encountered by said mole after said pipe has been expanded by said tapered body portion.

31. A mole for use in the trenchless replacement of in-situ pipe, comprising, a nose portion being engagable to a cable, a tapered body portion and a replacement pipe engagement portion, said mole further including at least one blade, said tapered body portion acting to expand said in-situ pipe for the replacement thereof with a length of replacement pipe, and said blade acting to cut pipe engagement devices encountered by said mole after said pipe has been expanded by said tapered body portion.

32. A mole as described in claim 31 wherein said blade includes a relatively thin portion that is disposable within said tapered body portion of said mole and an expanded portion that projects from said tapered body portion of said mole.

33. A mole as described in claim 31 wherein said blade is disposed within a slot formed in said mole, and wherein a rearward edge of said blade formed with an angle of approximately 80° with respect to a bottom edge of said blade, and wherein said slot is formed with a shape that corresponds to said angle, such that said blade is held within said slot.

34. A mole as described in claim 31 wherein a threaded bore is formed within said mole, and wherein a mole engagement fixture is fixedly engaged to an end of said cable, said fixture including a threaded end portion that is threadably engagable with said threaded bore.

35. A mole as described in claim 34 wherein said fixture further includes a hex nut portion integrally formed therewith and provided for the tightening of said threaded portion within said threaded bore.

36. A mole as described in claim 31, further including a replacement pipe engagement sleeve member for the engagement of said replacement pipe with said mole, said sleeve member being formed with cylindrical sidewalls and an internal radially projecting wall portion having a bore formed therethrough;

and wherein said mole is formed with a rearwardly projecting threaded portion that projects through said bore, such that a threaded nut may be threadably engaged thereto to secure said sleeve upon said mole;

said sleeve further being adapted for the thermal pressure bonding of said replacement pipe thereto.

37. A cable pulling device engagement frame comprising:

an annulus member including a cable passage bore formed therethrough and a cable insertion slot formed through portions of said annulus member for the sideways insertion of a cable within said cable passage bore of said annulus member;

a reaction plate having an enlarged surface for disbursing a reaction force against a cable pulling force generated through said annulus member.

38. A frame as described in claim 37 wherein said frame includes two cable pulling device engagement devices, such that two cable pulling devices can operationally function with said frame to pull two cables simultaneously.

39. A device as described in claim 38 wherein two annulus members function as said engagement devices to engage said two cable pulling devices.

40. A device as described in claim 39 wherein the two annulus members are angularly disposed relative to each other, such that two cable pulling devices are operationally engaged therewith.

41. A method for the trenchless replacement of in-situ pipe, comprising the steps of:

exposing a first end of said pipe;

exposing a second end of said pipe;

disposing a pulling cable through said pipe between said first end and said second end;

engaging a mole to said cable at said first end;

engaging a cable pulling device to said cable at said second end; and

installing a reaction plate at said second end, and pulling said mole through said pipe utilizing said cable pulling device.

42. A method as described in claim 41 wherein said second end is exposed within an excavated hole, and wherein a reaction plate is disposed against a sidewall of said hole.

43. A method as described in claim 41, further including the installation of a cable pulling device engagement frame between said reaction plate and said cable pulling device.

44. A method as described in claim 43 wherein said frame includes a pulley for changing the direction of said cable.

45. A method as described in claim 42 wherein said cable pulling device is disposed within said hole.

46. A method as described in claim 43 wherein said frame and said cable pulling device are disposed within said hole.

47. A method as described in claim 42 wherein said hole is formed of a minimal size.

48. A method as described in claim 41 wherein said cable pulling device is a post tensioning ram (PTR).